Insects as food: Knowledge, desire and media credibility. Ideas for a communication

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Abstract
Insects as food is a recommended cultural shift by the FAO, especially among Western consumers. The objective of this study is to understand those elements, which can most contribute to explaining the desire to eat insects as food. Therefore, we evaluated people's knowledge and beliefs about the benefits deriving from the farming and consumption of insects, for the health of man and the planet. Furthermore, we investigated people's perceived credibility towards the main sources of communication that can convey information on insects as food. Finally, some suggestions for possible future communication campaigns are presented.

Key words: insects, media credibility, knowledge, belief, desire.

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1. Introduction

According to the FAO document (van Huis et al., 2013), the introduction of insects into the Western diet is a recommended, and perhaps almost obligatory, way to ensure more sustainable food practices for the entire population. While in other countries the use of insects can be a valid alternative when other protein sources are scarce, in the case of the Western population

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where malnutrition is an uncommon issue, the use of insects should be included in the broader discourse on food sustainability. In the long run, in fact, the continuous use of an unsustainable diet can have very strong repercussions on all lives (van Huis & Oonincx, 2017). Not only, but probably also for this reason, with Regulation 2283/2015 on novel foods, the European Union has provided a regulatory framework for the breeding, marketing and consumption of some new foods, or at least considered such for the Western population. Indeed, these also include insects.

The introduction of this regulation has increased research into these foods. Several studies have focused on Western consumers' perception starting from the assumption that most of them refuse to eat insects. These studies have highlighted how various factors negatively affect the predisposition of Western consumers to eat insects (La Barbera et al., 2018; Hartmann & Siegrist, 2016). Conversely, some research has shown that Western consumers are increasingly interested in this type of novel food (Wool et al., 2019). Therefore, not merely disgust when it comes to eating insects, but also a positive attitude that leads to a predisposition to tasting (Onwezen et al., 2019; Alemu et al., 2017). Generally, the main motivation behind the choice to eat insects is the dimension of environmental protection for oneself and for future generations (Hartmann et al., 2018).

Since insects are not yet on the market in Italy, it is difficult for Italians to have been able to taste them in their lifetime. Therefore, we decided to focus this study exclusively on the *desire* for this type of food and not on real intentions. In fact, compared to intention, desire is more analysable regardless of behaviour. Furthermore, unlike intention, with desire there is no perception of being able to control the behaviour and of being able to implement that behaviour and the planning that precedes it (Malle et al., 2001).

As has emerged elsewhere (Milani Marin & Jacomuzzi, 2020, Piha et al., 2018), to promote the spread of insects, it is of fundamental importance that there is more information on the subject. In the present context, trust is essential in understanding consumers' reaction to food innovation, as it also helps simplify complexity and manage the uncertainty of the future; in fact, trust in communication plays a crucial role in dealing with sensitive issues, especially in the food sector (Love et al., 2013).

To our knowledge, no research conducted in Italy has investigated how consumers perceive the media with reference to the transmission of information on insects.

2. Methods

The objectives of this research are to describe:

a. consumers' beliefs comparing the benefits of the consumption of insects and that of the traditional food they eat daily;
b. their knowledge about insects as food;
c. the reasons that most explain the desire to taste insects;
d. the credibility of the main media with regard to information on insects.

The questionnaire was developed based on the aforementioned literature and previous qualitative research (Milani Marin and Jacomuzzi, 2020). The questionnaire was administered through software for the management of online questionnaires through a non-probabilistic model.

The first part of the questionnaire collected socio-demographic information from the respondents; the second part gathered their opinions on the benefits of insects compared to the food the respondents eat daily and the level of knowledge of the topic. The third part asked questions investigating the reasons for the desire to eat insects. The questions of the last part on communication were developed based on a previous study (Hunt and Frewer, 2001). In particular, the following expectations were investigated, which constitute credibility towards a source of information: i) trust; ii) reporting bias: the degree to which the information given is expected to correspond to reality; iii) skill level: the degree of skill or knowledge they are assumed to have about insects as a source of nutrition

Respondents indicated their degree of agreement with the questions related to these aspects on a five-point Likert scale, for six communication channels.

2.1. Statistical analyses

A descriptive analysis was conducted for the objectives a., b. and d.; a multiple linear regression was calculated to predict the desire to purchase based on motivation and the perception of having enough information to make an informed food choice (objective c).

2.2. Results and discussion

A total of 209 respondents completed the entire questionnaire (Table 1). Most of the respondents are female (67.5%) and are aged between 40 and 49

(45.9%). Also in other research, the majority of respondents are female (Viana et al., 2008). This data could depend on the fact that women are usually responsible for managing food purchases and that they are probably more interested in food and nutrition issues. With reference to education, the respondents have a lower/upper secondary school diploma (38.8%) or a university degree (39.2%).

Table 1 – Socio-demographic characteristics of the respondents[*]

Gender		
	Female	67.5
	Male	32.5
Education		
	Lower/upper secondary school	38.8
	University degree	39.2
	Master's degree	11.5
	PhD/specialization	10.5
Age		
	< 18	8.6
	18-29	13.9
	30-39	14.4
	40-49	45.9
	50-59	8.1
	> 59	9.1

[*] Data are expressed as a percentage

2.3. Beliefs and knowledge

Table 2 shows consumers' beliefs on the presence of benefits or risks in eating insects by comparing this consumption with that of everyday foods. 50% say they do not know if the effects on people's health related to farming are mainly positive or negative compared to the food they eat; similarly 49.1% say they do not know whether the effects on people's health related to the consumption of insects are mainly positive or negative compared to

the food they eat. Instead, 57.5% argue that the effects on environmental health related to insect farming are mainly positive. Consumers mainly recognize the positive aspects related to insect farming, in contrast, they are less aware about how eating insect can benefit human health.

Generally, we can identify two trends. A large number of respondents believe that the consumption of insects has more benefits than the food they usually consume; and another group claims that they do not know the possible effects. These data suggest that the respondents, despite having never tasted insects and living in a country where insects cannot be farmed or sold for human nutrition, have a positive attitude towards this food.

Table 2 – Beliefs: "Compared to the traditional food I eat, I think the effects..."[*]

	Very positive	Very negative	The same	I don't know
Related to insect farming on my health are	21.2	0.9	27.9	50
Related to insect farming on environmental health are	57.5	0.4	10.2	31.9
Related to the consumption of insects on my health are	12.8	2.2	35.8	49.1
Total	100	100	100	100

[*] Data are expressed as a percentage

Table 3 shows the knowledge that consumers have about insects, in particular about their possible benefits and their marketing in Italy. Most (84.2%) know that they have a high protein value and only 15.3% cannot answer the question; there are higher percentages of consumers who do not know that insect farming requires little water (50.2%), that they can be raised with food waste (46.9%) or that their farming produces little greenhouse gases (43.5%). Finally, a substantial number (n, 62.2%) do not know if they can be marketed in Italy.

These data highlight that the respondents' knowledge refers above all to the benefits that the consumption of insects brings to people's health. Instead, the knowledge of topics that can be defined as more "technical" and related to food sustainability is less widespread. In detail, the fact that insect farming requires little water, produces few greenhouse gases and that insects can be farmed with food waste does not seem to be widespread knowledge among the respondents. Finally, the respondents showed some degree of confusion about the possibility of finding insects on the market in Italy.

In summary, the data shows that respondents have good knowledge of some general aspects of insect consumption and farming. Furthermore, the beliefs on the positive effects of the consumption of insects are very positive

when compared with the opinions on the benefits of consuming traditional foods. Particularly, the benefits seem to be mainly linked to the environment. It is interesting to note that similar beliefs have emerged for the choice of the ethical products (Lindeman & Väänänen). On the other hand, many people are unable to express an opinion on the personal health benefits. Finally, a large percentage of respondents still show that they do not know how to make such a comparison.

Table 3 – Knowledge[*]

	Protein value	A lot of water required	Farmed with food waste	Little greenhouse gas	Marketed in Italy
yes	84.2	1.0	51.7	54.5	13.9
no	.5	48.8	1.4	1.9	23.9
I don't know	15.3	50.2	46.9	43.5	62.2
Total	100.0	100	100	100	100

[*] Data are expressed as a percentage

2.4. Desire to eat insects

A Pearson correlation was conducted to verify if there were any relationships between the variables (Table 5). A two-tailed significance test showed that all the correlations are statistically significant. Overall the results suggest that consumers with high taste intentions tend to be guided in their choice by several factors. The correlation table shows that the various factors are correlated.

With a linear regression (Table 6) a significant regression equation was found ($F(4, 221) = 106.517$, $p < .000$), with R^2 of .658. Four variables make the model statistically significant, $p < .05$. As has already emerged in previous research (Sekerka et al., 2014), the desire to eat insects depends on both emotional and cognitive processes. In the model, "cooking" is the predictor that best explains the desire to eat insects (.463).

The linear regression shows that the ability to cook plays a major role in explaining the desire to eat insects. In addition to the cognitive and emotional dimensions, it seems to be important, in terms of communication, to also focus on the experiential dimension. Previous research has already shown the importance of tasting (Hamerman, 2016) and therefore the possibility of seeing, touching and smelling insects to increase consumer engagement.

However, the possibility of cooking has a higher level of involvement than that required in bug banqueting or in tasting sessions in general. In fact, it requires the person try handling insects and preparing them for cooking. Furthermore, it requires greater knowledge of how to treat these insects and, finally, through cooking and incorporating the insects into one's dishes, a strong symbolic act is carried out at the level of identity.

Table 4 – Awareness, hedonism and values

	Desire	Awareness	Environment	Morals	Cooking
Tot	226	226	226	226	226
Average	2.58	2.35	3.08	3.00	2.30
DS	1.109	1.085	1.154	1.202	1.098

Table 5 – Correlations

Correlations				
		Awareness	Environment	Morals
Awareness	Pearson correlation	1		
Environment	Pearson correlation	.479**	1	
Morals	Pearson correlation	.396**	.699**	1
Cooking	Pearson correlation	.529**	.624**	.601**

**. The correlation is significant at 0.01 (2-tailed).

Table 6 – Linear regression

Model summary			
Model	R	R Square	Adjusted R Square
1	.811[a]	.658	.652

a. Predictors: (Constant), cooking, awareness, morals, environment

Anova[a]					
Model		Sum of squares	df	Mean square	F
1	Regression	182.329	4	45.582	106.517
	Residual	94.574	221	.428	
	Total	276.903	225		

a. Dependent variable: desire

b. Predictors: (Constant), cooking, awareness, morals, environment

Coefficients[a]					
Model		Non-standardized coefficients		Standardized coefficients	t
		B	Std error	Beta	
1	(Constant)	.147	.136		1.084
	Awareness	.189	.049	.185	3.885
	Environment	.164	.058	.170	2.838
	Morals	.143	.053	.155	2.690
	Cooking	.463	.056	.458	8.235
a. Dependent variable: desire					

Table 7 – Sources of communication

	Trust Average (SD)	Level of knowledge Average (SD)	Reporting bias Average (SD)
Popular press	1.91 (1.104)	2.04 (1.123)	1.96 (1.222)
News broadcasting	1.57 (1.057)	1.89 (1.084)	2.15 (1.169)
Sales point brochures	1.56 (1.006)	2.40 (1.237)	2.24 (1.305)
Social networks	.91 (.905)	1.96 (1.225)	2.41 (1.171)
Information sites	1.48 (.939)	2.09 (1.102)	2.30 (1.127)
Nutrition and health sites	2.24 (.970)	2.63 (1.077)	1.94 (1.198)

With reference to trust in information sources, consumers have a higher average level of trust in nutrition-themed sites (2.24), and social networks are the sources for which average trust is very low (.91). Instead for offline sources, the popular press is the source for which trust is on average higher (1.91). The highest average level of experience is once again nutrition and health sites (2.63), while the lowest one is news broadcasting (1.89).

Finally, social networks are the source with a higher average reporting bias than the others (2.41) and nutrition and health sites have the lowest average (1.94).

Generally, it appears that online sources, particularly nutrition and health sites, are the ones consumers have most trust in and perceive as having a higher level of knowledge and less reporting bias. Among the offline sources, the popular press is the source people have most trust in and which have the least reporting bias. Especially for food choice, trust is essential for managing the uncertainty that consumers face on a daily basis (Zhang et al., 2016) and contributes to the reduction of the complexity of a controversial topic (Love et al., 2013), as eating insects is.

3. Conclusions

Based on the above-discussed findings, we now present the key elements and propose some ideas for possible future communication campaigns.

The first research questions were about the consumers' beliefs and knowledge about eating insects. When compared to the daily food, insects are in a favourable position, as consumers recognise some benefits, which are especially related to what happens outside their bodies. On the other hand, it emerges that positive beliefs and certainties fall away when consumers think about the benefits related to the insects consumption (that is ingestion). Hence, the consumers' body remains the most important element at risk when introducing a new food. This uncertainty also emerges when considering the level of knowledge about insect farming and commercialization.

The data about beliefs and knowledge suggest considering an information campaign, which simply and comprehensively communicates some essential information to increase consumer awareness. On one side, there is the nutritional information highlighting the health benefits for people; on the other, some basic information on the farming methods and their effects on the environment. This information is very important, especially in the present historical context, in which food security and animal well-being are crucial aspects in the consumer's decision-making process (Schilstra and Fischer, 2020). Information should address both possible risks and benefits to people's lives, the environment and also the local community. Additionally, information about the commercialization of insects might be an essential tool to allow consumers acting in the market in an informed way.

With reference to the reason that most explain the desire to taste insects, the possibility of cooking them largely determines this desire. Since it is not yet possible to have a sensory experience with insects as food, more information about how to cook and prepare insects, as well as recipes, are required. It could be useful to focus communication on the strictly culinary dimension by addressing cooking lovers, also by introducing discussions linked to the exotic nature of the food. In fact, food consumption can be positive influenced by information that underlines the novelty of a product (Deegan et al., 2015). This information would thus constitute a preparatory moment to help people decrease fear and reticence towards insects by decreasing the factors of unfamiliarity and strangeness, as already emerged in previous studies (Boccia, 2018). Furthermore, communication campaigns would allow consumers to increase their vocabulary by making the knowledge on the subject more positive and nourishing and strengthening a

positive attitude towards future consumption experiences (Clarkson et al., 2013).

As far as channels are concerned, nutrition and health sites and the popular press are the most trusted sources. Therefore, a cross-media communication strategy might be useful to create integrated campaigns involving different actors. Thus, scientist, but also chefs, could be involved in order to provide consumers reliable information and to emotionally engage them with the construction of a pleasant imaginary. People usually have food consumption habits that follow a routine, which consolidates over time. However, when the routine is interrupted, either for a personal event or for a larger global event, then the practices are questioned and the path opens up to alternative ways of understanding and consuming food. In this historical moment in which a pandemic has not only revolutionized consumption styles, but also reminded us of the close link between man and natural resources, informing people about alternative sources of food and communicating a possible and new imaginary could be an essential and urgent step.

In conclusion, consumers desire to eat and cook insects, however, insects cannot be found in the supermarket; future research should investigate the wider socio-economical and legislative dynamics that impede the farming and commercialization of insects as food.

Research Transparency Statement

The authors are willing to share their data, analytics methods, and study materials with other researchers. The material will be available upon request.

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